# WIND TURBINE

## Technical Field

The present invention relates, in general, to improvements in a wind turbine, and, more particularly, to a wind turbine which is constructed to generate electricity from wind with low velocity from any direction.

## Background Art

These days, wind turbines for generating electricity using the wind have been disclosed in the art. The conventional wind turbine comprises a support column which is secured in the ground to have a substantial height, a propeller-shaped rotor which is mounted to an upper end of the support column, and a generator which generates electricity using rotation force of the propeller-shaped rotor.

However, the conventional wind turbine constructed as mentioned above is encountered with a problem in that it occupies a large volume when considering its power generation capacity. Since the rotor, generator and the other parts must be positioned high, installation costs are increased, and it is difficult to conduct repair and maintenance works. Also, the wind turbine may be damaged by exposure to strong wind. Further, in consideration of the structure of the rotor, electricity can be generated only when a wind velocity of at least 5-6 m/sec is maintained. Moreover, because a direction of the rotor should be manually changed in conformity with a wind direction, operational efficiency of the wind turbine is deteriorated in such areas where a light wind blows and the wind direction frequently changes. Furthermore, due to the fact that a center of gravity is placed at a substantial height, it is difficult to install the wind turbine on a ship or an offshore structure. Besides, the support column and the rotor are likely to be damaged by heavy winds.

Disclosure of the Invention

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a wind turbine which is constructed to allow a cylindrical fan to be rotated irrespective of a wind direction and a wind velocity so that electricity can be reliably generated even in such areas where a light wind blows, and which has a lowered center of gravity to be easily mounted even on a ship or an offshore structure.

In order to achieve the above object, according to one aspect of the present invention, there is provided a wind turbine adapted to generate electricity using wind power or tidal power, comprising: rotation shaft means for supporting a rotating structure to transmit wind power to a generator, and a plurality of blades secured to the rotation shaft means to be spaced apart one from another in a circumferential direction; wherein each blade has a lattice composed of transverse lattice elements and longitudinal lattice elements which are plaited to cooperatively define a plurality of spaces; and wherein, in each space, a rotation adjustment piece is coupled to a first portion of a transverse or longitudinal lattice element by a hinge to be capable of rotating between a closing position where it closes the space and an opening position where it opens the space, and a stopper projection is formed on a second portion of an opposite transverse or longitudinal lattice element to limit rotation of the rotation adjustment piece to a predetermined angle, so that the blades as a whole can be rotated irrespective of a wind direction; whereby, when the rotation adjustment piece is engaged with the stopper projection, the rotation adjustment piece reaches the closing position and is held on the same plane as its corresponding blade, so that electricity can be generated using wind applied to the rotation shaft means through rotation adjustment pieces.

According to another aspect of the present invention, there is provided a

wind turbine adapted to generate electricity using wind power or tidal power, comprising: rotation shaft means for supporting a rotating structure to transmit wind power to a generator, and a plurality of blades secured to the rotation shaft means to be spaced apart one from another in a circumferential direction; wherein each blade has a lattice composed of transverse lattice elements and longitudinal lattice elements which are plaited to cooperatively define a plurality of spaces; and wherein, in each blade, each of several rotation adjustment pieces is coupled to a portion of a longitudinal lattice element to be capable of rotating between a closing position where it closes a predetermined number of the spaces and an opening position where it opens the predetermined number of the spaces, so that several rotation adjustment pieces can cover an entire surface of each blade and thereby the blades as a whole can be rotated irrespective of a wind direction; whereby, depending upon a rotated position, the rotation adjustment pieces can open or close the spaces, so that electricity can be generated by using wind applied to the rotation shaft means through the rotation adjustment pieces held in the closing position.

Brief Description of the Drawings

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating a wind turbine in accordance with an embodiment of the present invention;

FIG. 2 is a longitudinal cross-sectional view illustrating the wind turbine according to the present invention;

FIG. 3 is a transverse cross-sectional view illustrating blades of the wind turbine according to the present invention;

FIG. 4 is an enlarged view illustrating a blade of the wind turbine according to the present invention;

FIG. 5 is a view illustrating a state wherein a rotation adjustment piece of the blade is in a closing position;

FIG. 6 is a view illustrating another state wherein the rotation adjustment piece of the blade is in an opening position;

FIG. 7 is a longitudinal cross-sectional view illustrating a variation of the blade structure of the wind turbine according to the present invention; and

FIG. 8 is a transverse cross-sectional view illustrating the variation of the blade structure of the wind turbine according to the present invention.

Best Mode for Carrying Out the Invention

Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

FIG. 1 is a perspective view illustrating a wind turbine in accordance with an embodiment of the present invention; and FIG. 2 is a longitudinal cross-sectional view illustrating the wind turbine according to the present invention. A wind turbine in accordance with an embodiment of the present invention includes a rotation shaft 1 which is arranged between upper and lower circular plates 14 and 15, and a rotation cylinder 2 having a plurality of blades 3 is placed around and rigidly connected to the rotation shaft 1. The plurality of blades 3 are secured to the rotation cylinder 2 to be spaced apart one from another in a circumferential direction. Each blade 3 has a lattice 4 composed of transverse lattice elements 4a and longitudinal lattice elements 4b which are plaited to cooperatively define a plurality of spaces. In each of the spaces, a rotation adjustment piece 10 is coupled to a first portion of a transverse or longitudinal lattice element 4a and 4b by a hinge 12 to be capable of rotating between a closing position where it closes the space and an opening position where it opens the space. A stopper projection 13 is formed on a second portion of an opposite

transverse or longitudinal lattice element 14a and 14b to limit rotation of the rotation adjustment piece 10 to a predetermined angle, so that the blades 3 as a whole can be rotated irrespective of a wind direction. When the rotation adjustment piece 10 is engaged with the stopper projection 13, the rotation adjustment piece 10 reaches the closing position and is held on the same plane as its corresponding blade 3, so that electricity can be generated using wind force applied to the rotation shaft 1 through rotation adjustment pieces 10.

A bearing part 5 and a fan gear 6 are installed below the rotation shaft 1 in a manner such that the fan gear 6 is meshed with a generator gear 7. By this fact, wind power is transmitted to a generator 8 which generates electricity. Electricity generated by the generator 8 is charged in a charger 9 to then be appropriately supplied to places under need.

Hereafter, operations of the wind turbine according to the present invention, constructed as mentioned above, will be described in detail.

As shown in FIG. 3, if wind blows from the direction indicated by the arrows, the wind collides with and forces the left blades 2A and right blades 2B. At this time, as described above, each blade 3 has the lattice 4 composed of the transverse lattice elements 4a and the longitudinal lattice elements 4b which are plaited to cooperatively define the plurality of spaces. Also, in each of the spaces, the rotation adjustment piece 10 is coupled to the first portion of the transverse or longitudinal lattice element 4a and 4b by the hinge 12 to be capable of rotating between the closing position where it closes the space and the opening position where it opens the space. Therefore, the rotation adjustment pieces 10 which are installed on the left blades 2A are rotated in a clockwise direction to be opened substantially parallel to the wind direction. On the contrary, the rotation adjustment pieces 10 which are installed on the right blades 2B are rotated in a counterclockwise direction which is opposite to the clockwise direction where the rotation adjustment pieces 10 of the left blades 2A are rotated, and then are engaged with the stopper projections 13 to be prevented from being further rotated and held on the same planes as the corresponding blades 3. As a

consequence, when viewing the blades 3 at the position of the rotation shaft 1, since the wind power which is applied to the right blades 2B is larger than the wind power which is applied to the left blades 2A, the rotation shaft 1 is rotated in the clockwise direction.

While the above description is given on the assumption that wind blows from the left blades 2A toward the right blades 2B, a person skilled in the art will readily recognize that the rotation shaft 1 is rotated in a similar manner even when wind blows from any directions on the blades 3. If the rotation shaft 1 is rotated, since the fan gear and the generator gear 7 disposed below the rotation shaft 1 are meshed with each other, power is transmitted to generate electricity. Electricity generated by the generator 8 is charged in the charger 9 to then be appropriately supplied to places under need. Accordingly, it is possible to generate electricity irrespective of a wind direction.

Due to the fact that the blades 3 are arranged between the upper and lower circular plates 14 and 15, it is possible to protect the blades 3 from heavy winds. The bearing 5 is installed in the lower circular plate 15 to ensure that the blades 3 are reliably rotated.

While the above embodiment is described with reference to wind power generation, it is to be readily understood that the electricity generating structure of the present invention can be securely installed in water to serve as a tidal power generator. In other words, at any place such as offshore, sea bottom, river, and the like, where hydraulic flow occurs, electricity can be efficiently generated in the same manner as in the case of the wind power generation.

FIG. 7 is a longitudinal cross-sectional view illustrating a variation of the blade structure of the wind turbine according to the present invention; and FIG. 8 is a transverse cross-sectional view illustrating the variation of the blade structure of the wind turbine according to the present invention. In this variation, upper and lower circular plates 14 and 15, a rotation shaft 1 which is arranged between the upper and lower circular plates 14 and 15, and blades 3 securely connected to the rotation shaft 1 and each having a lattice 4 composed of transverse lattice

elements 4a and longitudinal lattice elements 4b which are plaited to cooperatively define a plurality of spaces, are configured in the same manner as in the above-described embodiment. According to this variation, in each blade 3, each of several rotation adjustment pieces 10' is coupled to a portion of a lattice element 4a or 4b to be capable of rotating between a closing position where it closes a predetermined number of the spaces and an opening position where it opens the predetermined number of the spaces, so that the several rotation adjustment pieces 10' can cover an entire surface of each blade 3 and thereby the blades 3 as a whole can be rotated irrespective of a wind direction. That is to say, in this variation, each rotation adjustment piece 10' has an increased size when compared to that of the rotation adjustment piece 10 of the above-described embodiment.

Preferably, the rotation adjustment pieces 10' are formed in a manner such that each rotation adjustment piece 10' can cover the longitudinal spaces which constitute one longitudinal column in each blade 3. More preferably, the rotation adjustment pieces 10' are formed in a manner such that each rotation adjustment piece 10' can cover the longitudinal spaces which constitute two longitudinal columns in each blade 3. At this time, it is preferred that the rotation adjustment piece 10' is made of a material such as fabric having a predetermined degree of flexibility and synthetic rubber.

A bearing part and a fan gear are installed below the rotation shaft 1 in a manner such that the fan gear is meshed with a generator gear. By this fact, wind power is transmitted to a generator which generates electricity. Electricity generated by the generator is charged in a charger to then be appropriately supplied to places under need.

In this variation, as in the aforementioned embodiment, the blades can be rotated irrespective of a wind direction to efficiently generate electricity.

## Industrial Applicability

As apparent from the above description, the wind turbine according to the present invention provides advantages in that, since it occupies a small volume and its center of gravity is lowered, installation costs are decreased, repair and maintenance works can be conducted in a simple way, and it is possible to easily manufacture a wind turbine of from small to large sizes. Also, the likelihood of the wind turbine to be broken by a typhoon or a sudden gust of wind is minimized. Moreover, it is possible to generate electricity even in such areas where a light wind blows, irrespective of a wind direction and a wind velocity, and the wind turbine can be easily installed on a ship or an offshore structure.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.